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The attached documents are exact copies of the European patent application described on the following page, as originally filed.

Les documents fixés à cette attestation sont conformes à la version initialement déposée de la demande de brevet européen spécifiée à la page suivante.

Patentanmeldung Nr. | Patent application No. | Demande de brevet n°

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Der Präsident des Europäischen Patentamts;
Im Auftrag

For the President of the European Patent Office

Le Président de l'Office européen des brevets
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Sheet 2 of the certificate
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RESOURCE RESERVATION IN 3G OR FUTURE GENERATION TELECOMMUNICATION NETWORK (IV)

This invention relates to telecommunications networks operating the Internet Protocol (IP), and relates especially to a method of reserving resources.

In third generation (3G) telecommunications networks, such as Universal Mobile Telecommunication System (UMTS), broad bandwidth is provided for services such as data and multimedia in addition to voice. An obvious need is that required Quality of Service (QoS) should be provided to users, but in IP networks, if contention for resources is not resolved, then QoS cannot be guaranteed.

In IP networks or the Internet in general, Resource reSerVation Protocol (RSVP) is used to allow the network to reserve resources so as to provide QoS. RSVP can be used for QoS control locally or it may be used across IP networks.

RSVP is an end-to-end protocol and is illustrated in Figure 1. A transmitting user 10 sends to a receiving user 12 a message PATH. The PATH message carries the traffic characteristics information such as Tspecs to indicate the traffic behavior that is to be sent from the user 10. When the receiving user receives the PATH message, it sends a RESV message which contains QoS requests such as FlowSpecs. In practice, the transmitting and receiving users 10, 12 can be located remotely so that PATH and RESV messages pass through several nodes in UMTS. As each node receives either of the messages, it makes a decision as to whether adequate resources in that node can be reserved. If this is possible, then the messages are relayed to the next hop for the PATH message and to the previous hop for the RESV message. When the RESV message reaches the transmitting user 10, it begins to transmit data.

Periodic refresh messages are sent subsequently to maintain the QoS status at each node in which it has been set up.

At the TSG-SA Working Group 2 meeting no. 12 in Tokyo, 6-9 March 2000 a disclosure was made by applicant of arrangements in which a mobile system using RSVP can communicate across a GPRS/UMTS network with another RSVP user; a proxy activated by the mobile receives and processes PATH messages and generates RESV messages in return.

Applicant's copending European patent application no. [Lucent Case

X. Chen 13

Name/No. X. Chen 11/ IDS No. 122413] filed on even date describes an inventive method in which RSVP messages are filtered at a mobile and at a Serving GPRS Support Node (SGSN) or a Gateway GPRS Support Node (GGSN), and the mobile and the support node are arranged to activate Packet Data Protocol (PDP) Context Activation Procedure. However, conflicts can arise in certain circumstances.

It is an object of the invention to provide a method of reserving resources in third or future generations of wireless mobile networks such as UMTS which has no or minimal impact on existing architecture or QoS procedures, that overcomes the aforementioned conflict.

According to the invention, in a third or future generation telecommunication network, a method of allocating resources for user traffic passing between a mobile terminal and a remote user, characterized in that unidirectional Resource reSerVation Protocol (RSVP) messages arecompared so as to detect any previous RSVP message for that session.

Preferably a flag is arranged to indicate that an RSVP message for that session has already been sent.

In the accompanying drawings, Figure 1 illustrates the operation of RSVP. The invention will be described by way of example only, with reference to figures 2-5 in which:-

Figure 2 illustrates schematically the UMTS QoS architecture for the control plane;

Figure 3 illustrates the interchange of messages in an uplink;

Figure 4 illustrates the interchange of messages in a downlink;

Figure 5 illustrates the uplink interchange of messages in an end-to-end session; and

Figure 6 illustrates the interchange of messages in a downlink direction.

In Figure 2 the UMTS 20 comprises a Core Network (CN) 22 formed by a Gateway GPRS Support Node (GGSN) 24 and a Serving GPRS Support Node (SGSN) 26; there is also a UMTS Terrestrial Radio Access Network (UTRAN) 28. A MT 30 communicates with the UTRAN 28 across a radio interface. The MT 30 is connected to Terminal Equipment (TE) 32 which may run non-UMTS specific applications. The

MT 30 is UMTS specific, and is capable of processing the traffic from the TE 32 to channel it appropriately to the UMTS, usually to the radio access network.

The GGSN 24 communicates with an External Network 40.

The UMTS 20 operates the application-specific Packet Data Protocol (PDP) context as usual to negotiate the QoS and activate the QoS control between the MT 30 and UMTS network 20.

Figure 3 illustrates traffic QoS in the uplink direction. RSVP messages are terminated only at the MT 30. The RSVP processing entity in the MT 30 is triggered by a PATH message from TE 32. In response, the MT 30 filters the message, analyses the RSVP parameters carried in the PATH message, and takes a decision whether to modify an existing secondary PDP context or to create a new secondary PDP context, to provide an updated QoS status. The secondary PDP context is then create/modified using the existing PDP Context Control procedures. If the PATH message is a first-time PATH message, a new secondary PDP context is created. If the PATH message is a refresh message with no modified QoS parameter, then no action is taken. The activate secondary PDP context message is sent by the MT 30 across the UTRAN 28 to the SGSN 26, which generates a create/modify PDP context Request message and passes it to the GGSN 24. Return messages from the GGSN are processed similarly by the SGSN, and the MT 30 filters the message and passes a RESV message to the TE 32. The TE 32 may send a refresh PATH message and receive a refresh RESV message.

An important feature of RSVP is its uni-directional QoS request delivery. Specifically, the QoS status in the uplink direction set up by using RSVP does not apply to the QoS status in the downlink direction. This means that a QoS status that applies in both uplink and downlink requires two separate RSVP session set-up processes so as to be in line with the two way QoS status as contained by the PDP context of UMTS. This increases the QoS session set-up time and further complicates the QoS control and management in separate directions, because each direction needs to be controlled and maintained separately.

However, there is a problem which may be termed a "racing" problem because an RSVP terminal may not be UMTS aware, i.e. it may not be aware of a two-way

nature of UMTS secondary PDP context. Then each end of an RSVP session may send RSVP messages independently from its remote peer. This means that the GGSN 24 will receive two PATH/RESV messages, each of which applies for each direction (one for uplink and the other for downlink). The same "racing " problem occurs when the RSVP messages are terminated only at the MT 30.

This racing problem has not previously been recognized. In the present invention the problem is resolved by checking if there is any existing secondary PDP context associated with RSVP QoS status by matching the end point information contained in the PDP context in comparison with the incoming RSVP messages. If no match is found, then no action will be taken upon receiving an RSVP message which will then be transparently delivered to the remote peer end as before.

In Figure 3 the points at which such message comparison takes place, in the MT 30, are indicated at M.

In Figure 4, which illustrates a downlink, RSVP is terminated only at the MT 30. The session is initiated from the External Network 40 and message processing is similar to that in Figure 3. The message comparison points, which may be in the MT 30 or the GGSN 24, are also indicated at M .

Figure 5 illustrates a variation in which a RSVP session is used end-to-end and is terminated at the MT 30 and the GGSN 24. The assumption is that TE 32 intends to set up an RSVP session with its remote peer, which also uses RSVP signaling, in the External Network 40. The Figure shows RSVP activated QoS in the uplink direction. When the MT 30 received a PATH message from TW 32, it checks to see if a PDP context exists for this RSVP session. If it does, the MT 30 triggers the Modify PDP context message if there is a change in QoS parameters.

When the PATH message is received at the GGSN 24, it uses this information, again along with relevant local configuration, to see if QoS Negotiated is the same as QoS Requested. The PATH message is then sent to the external network. Radio Access Barrier (RAB) negotiation can take place between the SGSN 24 and the UTRAN 28 if QoS Negotiated is different from QoS Requested. Finally, the RESV message returned from the external network is filtered by the GGSN, which creates or modifies a PDP Context request message, which is sent to the MT30.

The message comparison points in the MT30 and the SGSN24 are again indicated at M.

Figure 6 shows the end-to-end situation for the QoS control in the downlink direction with filtering in the MT and GGSN.

As before, the message comparison points to prevent the racing problem are indicated at M.

To overcome the racing problem, the comparisons at the point M can be made, for example, in two ways, both involving use of a flag.

In a first arrangement, a flag is made available in every PATH and RESV message by addition of a flag bit.

For an MT-only terminated arrangement, for every session, the flag is set by the MT 30 the first time a RSVP message is sent or received by the MT 30. The flag is sent to the receiving end in the RSVP message for this session, and the receiving end recognizes that it does not need to send a return RSVP message for this session. The message in which the flag is set may be either a PATH message or a RESV message.

If the flag has not been set, then no RSVP message has been sent and there can be no racing problem.

For an MT and support node terminated arrangement, either the MT or ghe SGSN/GGSN can set the flag. In this arrangement, the MT 30, the GGSN 24 and the SSGN 26 need a small modification so that it/they can set the flag bit and recognize when the bit has been set in a received message, and to act (or not act) appropriately.

In a second arrangement, a session flag is made available in PDP Context, which carries all the information about a session. The session flag can be set by either the MT 30 or the GGSN 24 or the SGSN 26.

For example, when the GGSN 24 receives a first RSVP message (whether it is a Path or a RESV message) it sets the session flag in PDP context; the RSVP message is sent by the GGSN in a first direction to the remote end; it is to be understood that the remote end does not receive a flag. When a return RSVP message in the opposite direction is received by the GGSN 24, it checks if the flag is set for that session; if the flag is set, the GGSN discards any further RSVP messages for that session, therefore the racing problem is avoided.

The GGSN also checks to see if the QoS requirement is the same as in the PDP Context sent out; if the QoS requirement is higher, the GGSN actions the Modify Existing PDP context protocol.

Usually a customer will have the option of deciding whether to change the QoS if it is lower than the present QoS requirement.

In the first arrangement according to the invention with a flag in the RSVP message, the MT 30 prevents the racing problem and the remote end does not pass on the RSVP message. The first arrangement can be applied to messages as shown in Figs 3 and 4 in which RSVP messages are filtered in the MT 30 only.

In the second arrangement according to the invention with the flag in the PDP context, the GGSN prevents the racing problem and the remote end does not pass on the RSVP message. The second type of flag is applicable to messages as shown in Figures 5 and 6 in which the RSVP messages are filtered at the MT 30 and the GGSN 24.

By such comparisons at any of the indicated positions, the aforesaid "racing" problem is overcome.

Either a RSVP message can be intercepted in the MT and the SGSN or GGSN 26, the MT or support node then initiating PDP context activation procedure, as described in applicant's copending European patent application no. [Lucent Case Name/No. X. Chen 11/ IDS No. 122413] filed on even date, or the RSVP messages can be "piggybacked" in an IP packet , as set out in applicant's application no. 00301782.9 filed on 3 March 2000.

CLAIMS

1 In a third or future generation telecommunication network, a method of allocating resources for user traffic passing between a mobile terminal (30) and a remote user characterized in that unidirectional Resource reSerVation Protocol (RSVP) messages are compared so as to detect any previous RSVP message for that session.

2 A method according to Claim 1 in which a flag is arranged to indicate that a RSVP message for that session has already been sent.

3 A method according to Claim 2 in which the flag is provided as an additional bit in every RSVP message.

4 A method according to Claim 2 or Claim 3 in which the mobile terminal (30) is arranged to set the flag.

5 A method according to Claim in 4 in which the mobile terminal (30) is also arranged to sense the presence of the flag.

6 A method according to Claim 1 in which the flag is a session flag and is provided in Packet Data Protocol (PDP) context.

7 A method according to Claim 6 in which a support node (24) of the network is arranged to set the flag and to send PDP protocol in a first direction.

8 A method according to Claim 7 in which the support node(24) is also arranged to sense the presence of the flag in PDP Protocol received in a second direction and to discard any subsequent RSVP messages for that session.

9 A method according to Claim 8 in which the support node (24) is also arranged to determine whether a Quality of Service requirement in the PDP message is higher than the Quality of Service requirement currently applicable to the session, and if so to modify the existing PDP message.

ABSTRACT

RESOURCE RESERVATION IN 3G OR FUTURE GENERATION TELECOMMUNICATION NETWORK III

In the UMTS, resource reservation is provided by using unidirectional RSVP messages to set up a bi-directional PDP context. The MT 30 and a support node 24 can be arranged to compare incoming RSVP messages with any existing secondary PDP context, and if a match is found, no action is taken on the incoming message. The match is made by determining whether a flag is set. This eliminates "racing" when each end of an RSVP session sends an RSVP message.

Figure 3.

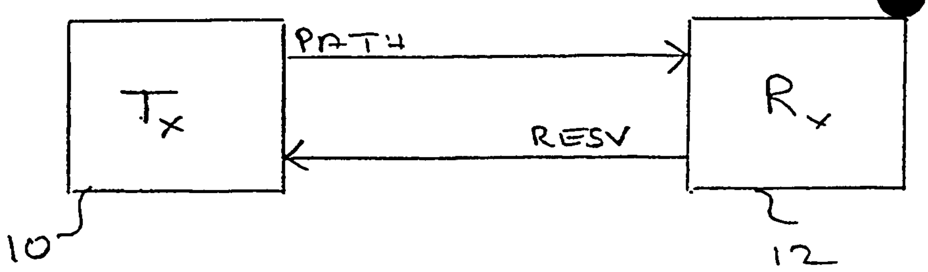

FIG. 1

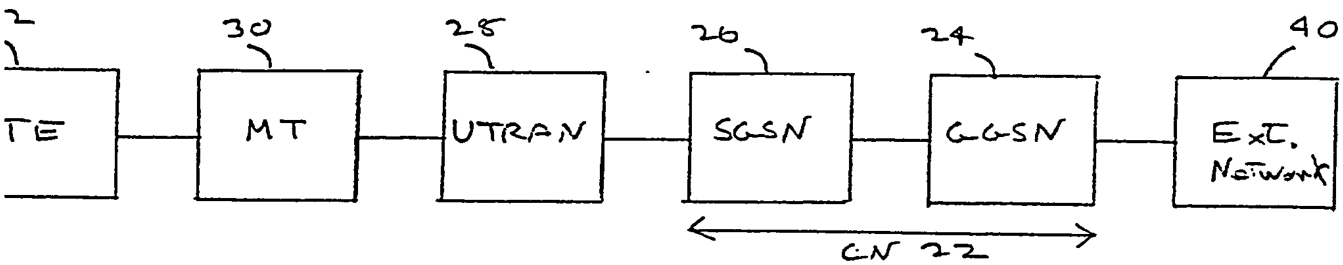

FIG. 2

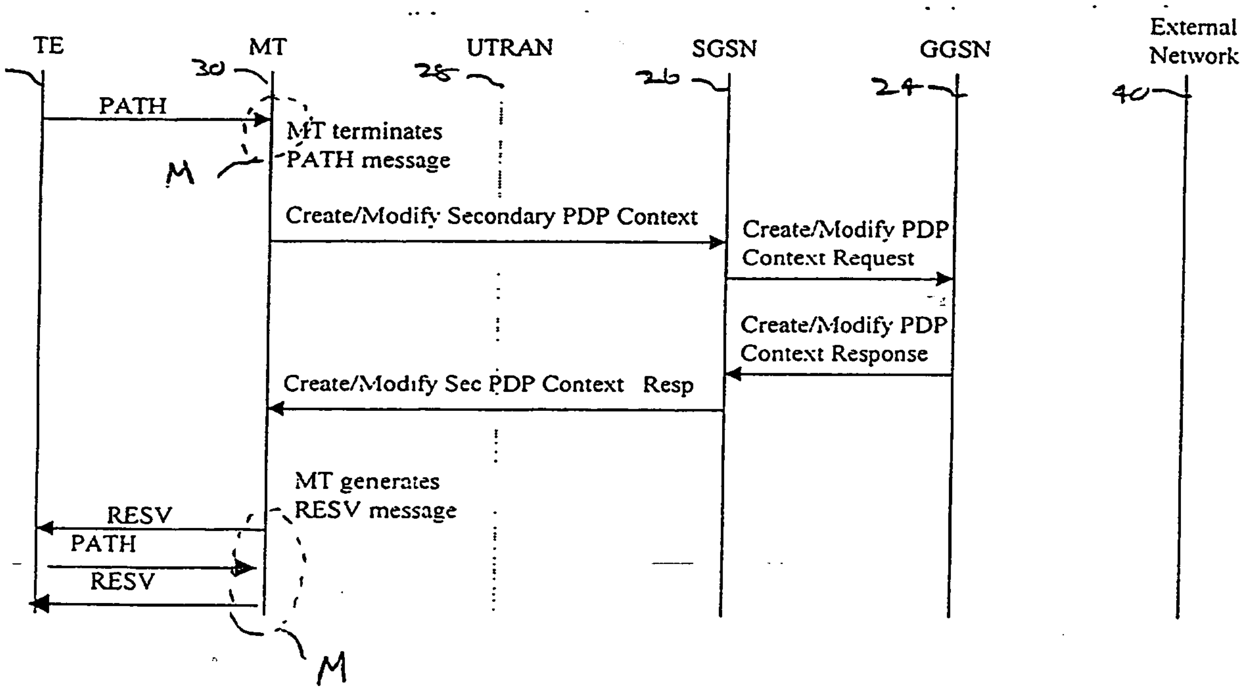

FIG. 3

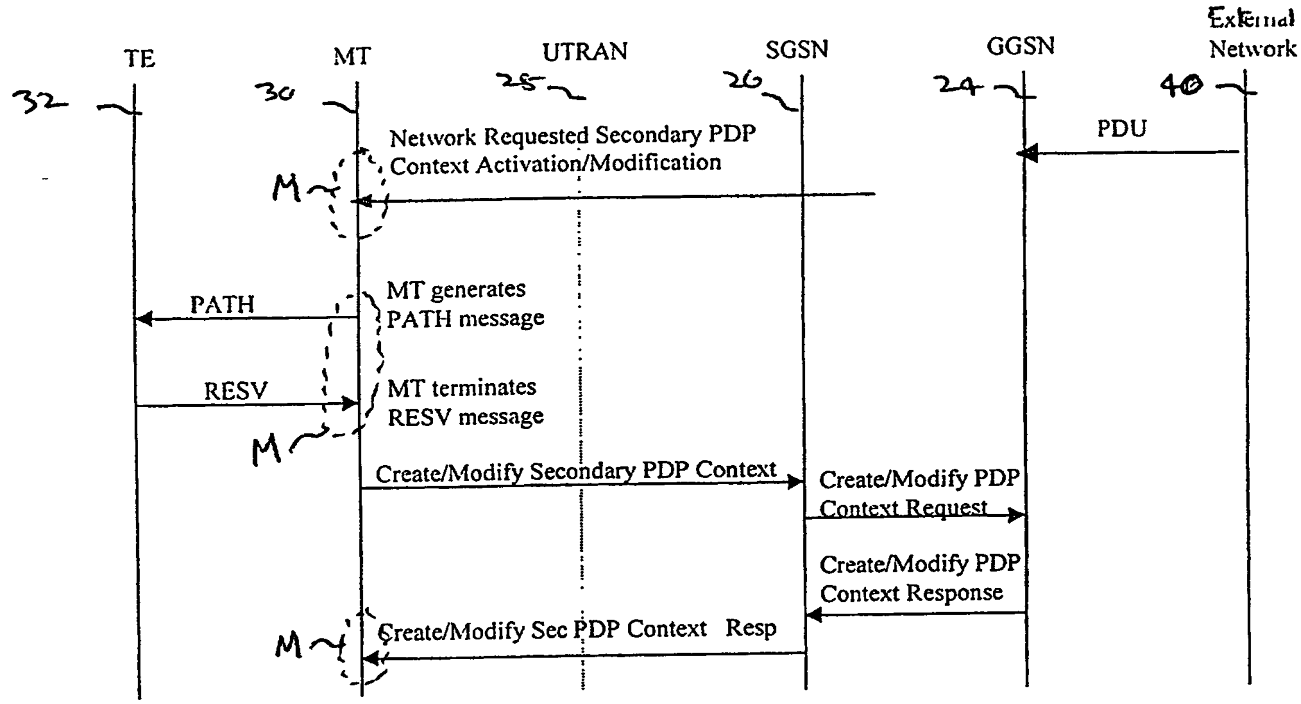
TE
MT
UTRAN
SGSN
GGSN
External Network
32
30
25
26
24
40
PDU
Network Requested Secondary PDP Context Activation/Modification
M
PATH
MT generates PATH message
RESV
MT terminates RESV message
M
Create/Modify Secondary PDP Context
Create/Modify PDP Context Request
Create/Modify PDP Context Response
Create/Modify Sec PDP Context Resp
M

FIG. 4

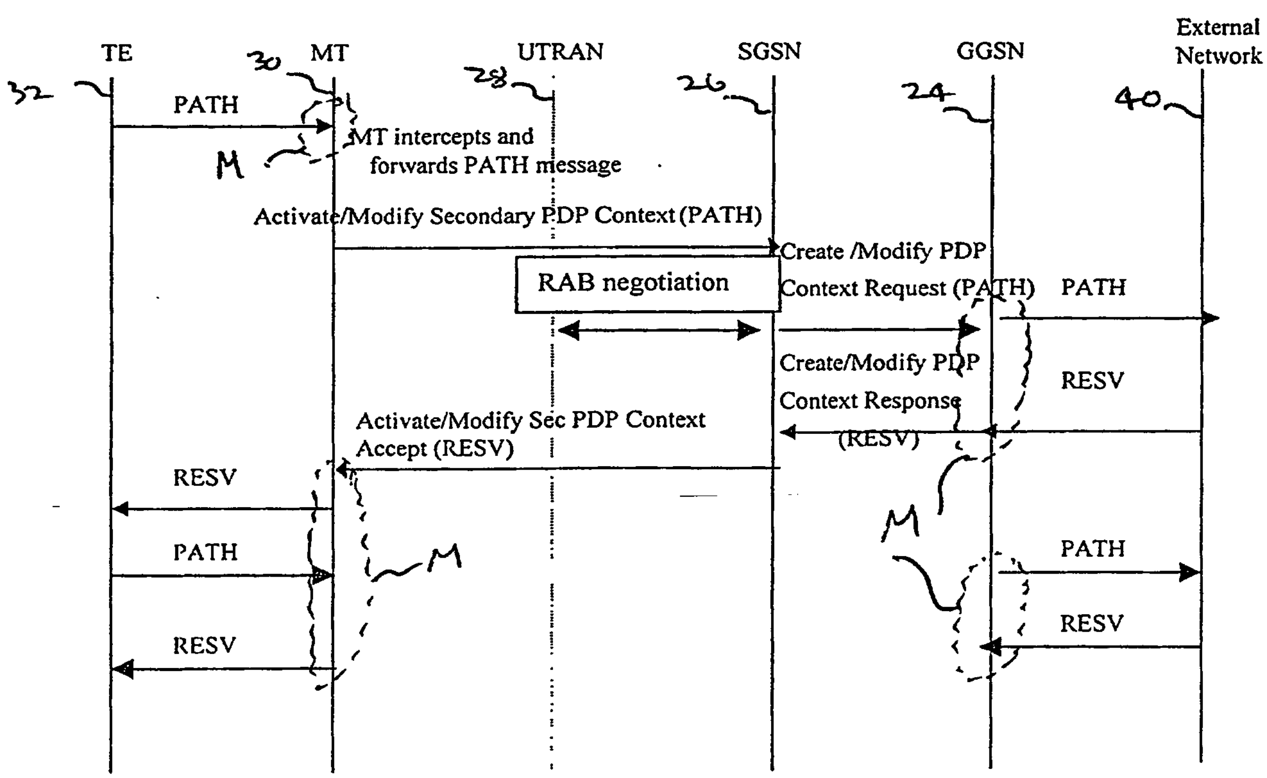
TE
MT
UTRAN
SGSN
GGSN
External Network
32
30
28
26
24
40
PATH
MT intercepts and forwards PATH message
M
Activate/Modify Secondary PDP Context (PATH)
RAB negotiation
Create /Modify PDP Context Request (PATH)
PATH
Create/Modify PDP Context Response (RESV)
RESV
Activate/Modify Sec PDP Context Accept (RESV)
RESV
PATH
RESV
M
M
PATH
RESV

FIG. 5

X clm 13

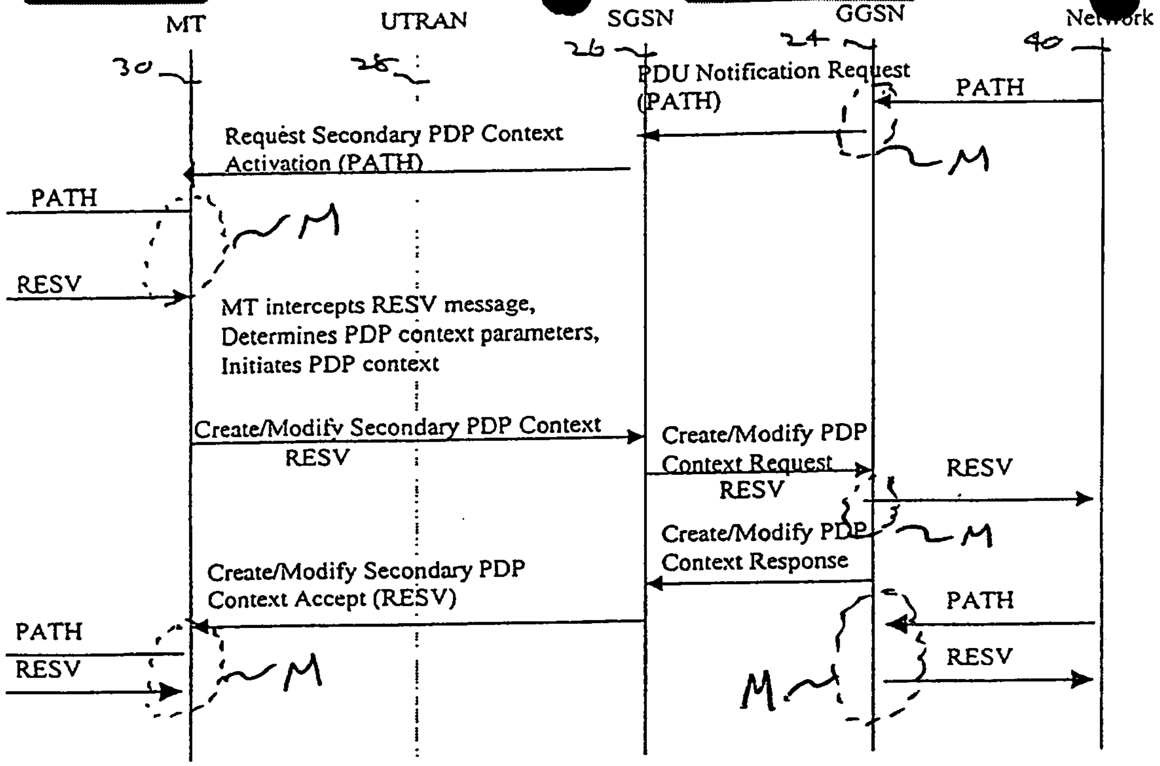
MT
UTRAN
SGSN
GGSN
External Network
30
28
26
24
40
PDU Notification Request (PATH)
PATH
Request Secondary PDP Context Activation (PATH)
M
PATH
RESV
M
MT intercepts RESV message,
Determines PDP context parameters,
Initiates PDP context
Create/Modify Secondary PDP Context
RESV
Create/Modify PDP Context Request
RESV
RESV
Create/Modify PDP Context Response
M
Create/Modify Secondary PDP Context Accept (RESV)
PATH
PATH
RESV
RESV
M
M

FIG 6